General

Guideline Title

Best evidence statement (BESt). Venous thromboembolism (VTE) prophylaxis in children and adolescents.

Bibliographic Source(s)

Cincinnati Children's Hospital Medical Center. Best evidence statement (BESt). Venous thromboembolism (VTE) prophylaxis in children and adolescents. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2014 Feb 18. 14 p. [40 references]

Guideline Status

This is the current release of the guideline.

Recommendations

Major Recommendations

The strength of the recommendation (strongly recommended, recommended, or no recommendation) and the quality of the evidence (1aâ€'5b) are defined at the end of the "Major Recommendations" field.

1. It is recommended that patients age 10 to 17 years who are expected to have a surgical procedure lasting at least 60 minutes be started at induction of anesthesia on a sequential compression device (SCD), for prophylaxis of venous thromboembolism (VTE), unless there are contraindications to mechanical prophylaxis (Schwenk et al., 1998 [2b]; Local Consensus, 2014 [5]; Coleridge-Smith, Hasty, & Scurr, 1990 [5]; Branchford et al., "Clinical," 2012 [5b]). See Table 1 in the original guideline document.
2. It is recommended that all patients age 10 to 17 years be assessed for VTE risk factors (see Table 2 in the original guideline document) and, based on that assessment, assigned to a risk category (low, moderate or high) (see Table 3 in the original guideline document):
    a. At the time of inpatient admission, and
    b. Reassessed at 48 to 72 hours of hospitalization
    (Branchford et al., "Risk," 2012 [4a]; Sharathkumar et al., 2012 [4a]; Local Consensus, 2014 [5]). See the Algorithm in the original guideline document.

3. It is recommended that VTE prophylaxis be administered based on risk category (see Table 4 in the original guideline document), as soon as feasible but within 24 hours of assessment, unless there are contraindications (see Table 1 and Table 5 in the original guideline document). See the Algorithm in the original guideline document.
    Note: Examples of risk factor mitigation strategies are: discontinuing peripherally-inserted central catheter (PICC) lines as soon as possible, treating infections, and avoiding estrogen therapy.

4. It is recommended, if planning to initiate pharmacologic prophylaxis:
    a. In surgical patients seek surgical input regarding bleeding risk, prior to initiation.

b. Obtain hematology consultation when considering alternative pharmacologic agents
(Alhazzani et al., 2013 [1a]; Barrera et al., 2013 [1a]; Handoll et al., 2002 [1a]; Bidlingmaier et al., 2011 [1b]; Kakkos et al., 2011 [1b]; Stem et al., 2013 [3b]; Local Consensus, 2014 [5]).

Definitions:

Table of Evidence Levels

Quality Level	Definition
1a† or 1b†	Systematic review, meta-analysis, or meta-synthesis of multiple studies
2a or 2b	Best study design for domain
3a or 3b	Fair study design for domain
4a or 4b	Weak study design for domain
5a or 5b	General review, expert opinion, case report, consensus report, or guideline
5	Local Consensus

†a = good quality study; b = lesser quality study.

Table of Language and Definitions for Recommendation Strength

Strength	Definition
It is strongly recommended that… It is strongly recommended that… not…	When the dimensions for judging the strength of the evidence are applied, there is high support that benefits clearly outweigh risks and burdens (or vice-versa for negative recommendations).
It is recommended that… It is recommended that… not…	When the dimensions for judging the strength of the evidence are applied, there is moderate support that benefits are closely balanced with risks and burdens.
There is insufficient evidence and a lack of consensus to make a recommendation…	

Note: See the original guideline document for the dimensions used for judging the strength of the recommendation.

Clinical Algorithm(s)

An algorithm titled "Risk Category Assessment and Prophylaxis for Venous Thromboembolism" is provided in the original guideline document.

Scope

Disease/Condition(s)

Venous thromboembolism (VTE)

Guideline Category

Management

Risk Assessment

Treatment

Clinical Specialty

Anesthesiology

Internal Medicine

Pediatrics

Surgery

Intended Users

Hospitals

Physicians

Guideline Objective(s)

To evaluate, among hospitalized children, if risk assessment and stratified venous thromboembolism (VTE) prophylaxis compared to no prophylaxis reduces VTE occurrence without an increase in significant adverse effects

Target Population

Hospitalized patients age 10 to 17 years (up to the 18th birthday)

Note: Patients with current venous thromboembolism (VTE) are excluded from this guideline.

Interventions and Practices Considered

Risk assessment and stratified venous thromboembolism (VTE) prophylaxis

Major Outcomes Considered

Reduced venous thromboembolism (VTE) occurrence without an increase in significant adverse effects

Methodology

Methods Used to Collect/Select the Evidence

Hand-searches of Published Literature (Primary Sources)

Hand-searches of Published Literature (Secondary Sources)

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

Search Strategies

Iterative searches were conducted in the course of the development of this document.

Search 1: Venous Thromboembolism (VTE) Prophylaxis in Pediatric Trauma and Orthopaedic Patients

- Databases: MEDLINE, Cochrane Database of Systematic Reviews (CDSR), CINAHL
- Terms: Various terms for VTE (VTE, DVT, PE, thrombosis, venous thrombosis, thromboembolism, deep vein thrombosis, pulmonary embolism) AND various terms for trauma or orthopaedic surgery (trauma, wounds, injuries, orthopedic) AND various terms for VTE prophylaxis (enoxaparin, heparin, anticoagulants fibrinolytic agents, prophylaxis combined with thrombus or embolus)
- Filters: Publication dates 2000 to present; pediatric studies only; English language
- Date search was conducted: November 14, 2012; update of search conducted January 13, 2014

Search 2: Adverse Events with VTE Prophylaxis in Hospitalized Children

- Databases: MEDLINE, Cochrane, CINAHL, Scopus, EBMR
- Terms: Various terms for VTE prophylaxis (enoxaparin, heparin, anticoagulants fibrinolytic agents, prophylaxis combined with thrombus or embolus) AND various terms for adverse events (hemorrhage, bleeding, risk of bleeding, adverse effect, adverse event)
- Filters: Publication dates 2000 to present; pediatric studies only; English language
- Date search was conducted: January 24, 2013; update of search conducted January 13, 2014

Search 3: Mechanical Prophylaxis of VTE

- Databases: MEDLINE, Scopus, CINAHL, CDSR
- Terms: Various terms for VTE (VTE, DVT, PE, thrombosis, venous thrombosis, thromboembolism, deep vein thrombosis, pulmonary embolism) AND various terms for mechanical prophylaxis (intermittent compression device, mechanical prophylaxis, sequential compression device, foot pump, pneumatic compression, graduated compression stocking, TED stockings, elastic compression stockings)
- Filters: No limits on patient age or on publication dates; English language
- Date search was conducted: February 26, 2013; update of search conducted January 13, 2014

Search 4: Definitions of Immobilization

- Database: MEDLINE
- Terms: Various terms for VTE (VTE, DVT, PE, thrombosis, venous thrombosis, thromboembolism, deep vein thrombosis, pulmonary embolism) AND various terms for immobilization (immobility, bed rest, bedridden, confined to bed)
- Filters: No limits on publication dates; pediatric studies or meta-analyses of adult studies; English language
- Date search was conducted: May 2, 2013; update of search conducted January 13, 2014

In addition, articles identified by members of the team and relevant articles from reference lists were considered.

Number of Source Documents

Not stated

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Table of Evidence Levels

Quality Level	Definition
1a† or 1b†	Systematic review, meta-analysis, or meta-synthesis of multiple studies
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Quality Level	Definition
4a or 4b	Weak study design for domain
5a or 5b	General review, expert opinion, case report, consensus report, or guideline
5	Local Consensus

†a = good quality study; b = lesser quality study.

Methods Used to Analyze the Evidence

Review of Published Meta-Analyses

Systematic Review

Description of the Methods Used to Analyze the Evidence

Not stated

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

Not stated

Rating Scheme for the Strength of the Recommendations

Table of Language and Definitions for Recommendation Strength

Strength	Definition
It is strongly recommended that… It is strongly recommended that… not…	When the dimensions for judging the strength of the evidence are applied, there is high support that benefits clearly outweigh risks and burdens (or vice-versa for negative recommendations).
It is recommended that… It is recommended that… not…	When the dimensions for judging the strength of the evidence are applied, there is moderate support that benefits are closely balanced with risks and burdens.
There is insufficient evidence and a lack of consensus to make a recommendation…	

Note: See the original guideline document for the dimensions used for judging the strength of the recommendation.

Cost Analysis

A formal cost analysis was not performed and published cost analyses were not reviewed.

Method of Guideline Validation

Peer Review

Description of Method of Guideline Validation

This Best Evidence Statement (BESt) has been reviewed against quality criteria by two independent reviewers from the Cincinnati Children's Hospital Medical Center (CCHMC) Evidence Collaboration.

Evidence Supporting the Recommendations

References Supporting the Recommendations

Alhazzani W, Lim W, Jaeschke RZ, Murad MH, Cade J, Cook DJ. Heparin thromboprophylaxis in medical-surgical critically ill patients: a systematic review and meta-analysis of randomized trials. Crit Care Med. 2013 Sep;41(9):2088-98. PubMed

Barrera LM, Perel P, Ker K, Cirocchi R, Farinella E, Morales Uribe CH. Thromboprophylaxis for trauma patients. Cochrane Database Syst Rev. 2013;3:CD008303. PubMed

Bidlingmaier C, Kenet G, Kurnik K, Mathew P, Manner D, Mitchell L, KrÃ¼mpel A, Nowak-GÃ¶ttl U. Safety and efficacy of low molecular weight heparins in children: a systematic review of the literature and meta-analysis of single-arm studies. Semin Thromb Hemost. 2011 Oct;37(7):814-25. PubMed

Branchford B, Wang M, Wathen B, Ranade D, Neiman J, Coughlin R, Pickard D, Children's Hospital of Colorado. Clinical care guideline: VTE prophylaxis 2012 (unpublished document). 2012.

Branchford BR, Mourani P, Bajaj L, Manco-Johnson M, Wang M, Goldenberg NA. Risk factors for in-hospital venous thromboembolism in children: a case-control study employing diagnostic validation. Haematologica. 2012 Apr;97(4):509-15. PubMed

Coleridge-Smith PD, Hasty JH, Scurr JH. Venous stasis and vein lumen changes during surgery. Br J Surg. 1990 Sep;77(9):1055-9. PubMed

Handoll HH, Farrar MJ, McBirnie J, Tytherleigh-Strong G, Milne AA, Gillespie WJ. Heparin, low molecular weight heparin and physical methods for preventing deep vein thrombosis and pulmonary embolism following surgery for hip fractures. Cochrane Database Syst Rev. 2002;(4):CD000305. [68 references] PubMed

Kakkos SK, Caprini JA, Geroulakos G, Nicolaides AN, Stansby GP, Tsolakis IA, Reddy DJ. Can combined (mechanical and pharmacological) modalities prevent fatal VTE?. Int Angiol. 2011 Apr;30(2):115-22. PubMed

Schwenk W, BÃ¶hm B, FÃ¼gener A, MÃ¼ller JM. Intermittent pneumatic sequential compression (ISC) of the lower extremities prevents venous stasis during laparoscopic cholecystectomy. A prospective randomized study. Surg Endosc. 1998 Jan;12(1):7-11. PubMed

Sharathkumar AA, Mahajerin A, Heidt L, Doerfer K, Heiny M, Vik T, Fallon R, Rademaker A. Risk-prediction tool for identifying hospitalized children with a predisposition for development of venous thromboembolism: Peds-Clot clinical Decision Rule. J Thromb Haemost. 2012 Jul;10(7):1326-34. PubMed

Stern J, Christensen A, Davis D, Raffini L. Safety of prophylactic anticoagulation at a pediatric hospital. J Pediatr Hematol Oncol. 2013 Oct;35(7):e287-91. PubMed

Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for most recommendations (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

- The risk stratification algorithm in the original guideline document may help identify patients at high risk for venous thromboembolism (VTE) and decrease unnecessary prophylaxis measures in low risk patients.
- VTE prophylaxis may prevent a life threatening event (pulmonary embolism) as well as chronic post-thrombotic syndrome.

Potential Harms

- Adverse event rates of sequential compression device (SCD) are low and generally minor. They include discomfort/intolerance and skin abrasions. Discomfort may lead to decreased adherence.
- Risk assessment is easily obtained from a patient's history and therefore is non-invasive. It could be harmful if done incorrectly.
- Subcutaneous injections are painful for patients and required a skilled provider for administration. Appropriate mechanical prophylaxis requires patient and nurse effort.
- Pharmacologic prophylaxis carries a significant risk of bleeding.

Contraindications

Contraindications

Contraindications to Mechanical Prophylaxis

- Deep vein thrombosis (DVT), suspected or existing (can use graduated compression stockings)
- Extremity to be used has acute fracture
- Extremity to be used has peripheral intravenous (PIV) access
- Skin conditions affecting extremity (e.g., dermatitis, burn)
- Unable to achieve correct fit due to patient size

Contraindications to Pharmacologic Prophylaxis

Absolute Contraindications

- Bleeding disorder, known or tendency
- Hemorrhage, evidence of or high risk of
- Platelet count unable to be sustained >50,000/mm^3

Relative Contraindications

- Intracranial mass
- Lumbar puncture or epidural catheter removal in prior 12 hours
- Neurosurgical procedure
- Pelvic fracture within past 48 hours
- Uncontrolled hypertension

Qualifying Statements

Qualifying Statements

This Best Evidence Statement addresses only key points of care for the target population; it is not intended to be a comprehensive practice guideline. These recommendations result from review of literature and practices current at the time of their formulation. This Best Evidence Statement does not preclude using care modalities proven efficacious in studies published subsequent to the current revision of this document. This document is not intended to impose standards of care preventing selective variances from the recommendations to meet the specific and unique requirements of individual patients. Adherence to this Statement is voluntary. The clinician in light of the individual circumstances presented by the patient must make the ultimate judgment regarding the priority of any specific procedure.

Implementation of the Guideline

Description of Implementation Strategy

Applicability and Feasibility Issues

There is evidence that venous thromboembolism (VTE) events are increasing in the pediatric population, and it has become evident to many providers, including medical and surgical specialists, that health care providers must do a better job of prevention. These care recommendations provide a means to assess patients at risk and mitigate that risk in the safest possible way. As the recommendations are newly developed, the feasibility of implementation has as yet been untested. Generally, the team believes implementation efforts will need to address:

1. Education and training of staff to perform the risk assessment and review of contraindications, and to order prophylaxis
2. Identifying an appropriate time and place during the hospitalization to apply the recommendations
3. Ensuring adequate equipment and supplies
4. Successfully achieving patient and family buy-in

A tool in the electronic health record (EHR) may need to be developed to improve reliable use of the recommendations.

Implementation Tools

Audit Criteria/Indicators

Clinical Algorithm

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Staying Healthy

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

Bibliographic Source(s)

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Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2014 Feb 18

Guideline Developer(s)

Cincinnati Children's Hospital Medical Center - Hospital/Medical Center

Source(s) of Funding

Cincinnati Children's Hospital Medical Center

Guideline Committee

Multidisciplinary Venous Thromboembolism (VTE) Prophylaxis Best Evidence Statement (BESt) Team

Composition of Group That Authored the Guideline

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Financial Disclosures/Conflicts of Interest

Conflict of interest declaration forms are filed with the Cincinnati Children's Hospital Medical Center (CCHMC) Evidence-Based Decision Making (EBDM) group. No financial or intellectual conflicts of interest were found.

Guideline Status

This is the current release of the guideline.

Guideline Availability

Electronic copies: Available from the Cincinnati Children's Hospital Medical Center Web site .

Print copies: For information regarding the full-text guideline, print copies, or evidence-based practice support services contact the Cincinnati Children's Hospital Medical Center James M. Anderson Center for Health Systems Excellence at EBDMInfo@cchmc.org.

Availability of Companion Documents

The following are available:

- Judging the strength of a recommendation. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2009 May 7. 1 p. Available from the Cincinnati Children's Hospital Medical Center (CCHMC) Web site .
- Grading a body of evidence to answer a clinical question. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2009 May 7. 1 p. Available from the CCHMC Web site .
- Table of evidence levels. Cincinnati (OH): Cincinnati Children's Hospital Medical Center; 2009 May 7. 1 p. Available from the CCHMC Web site .

Print copies: For information regarding the full-text guideline, print copies, or evidence-based practice support services contact the Cincinnati Children's Hospital Medical Center James M. Anderson Center for Health Systems Excellence at EBDMInfo@cchmc.org.

In addition, suggested process or outcome measures are available in the original guideline document .

Patient Resources

None available

NGC Status

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